Summary of Possible P Reduction from Hangman Creek

The following information was taken from the original efforts to develop a phosphorus TMDL to meet the 2007 TP allocations assigned by the Spokane DO TMDL. These estimates have been tabled since February 2008 pending the development of a DO/pH TMDL to address the in watershed nutrient impairments and possibly new allocations from the Spokane DO TMDL. There is a high probability that the numbers presented below will change in the final DO/pH TMDL for Hangman Creek but they provide a rough estimate of what may be accomplished to various management practice changes, and restoration efforts in the watershed. The 7 year average predicts approximately a 20% reduction of phosphorus delivery to the Spokane River. However, there is a lot of variability by month or season and from year to year.

The turbidity/TSS TMDL currently in draft predicts a 20% to 30% sediment delivery reduction to the Spokane River under the estimated full protection scenario. Phosphorus levels will also be reduced with this reduction. Phosphorus reductions at the mouth of Hangman Creek were estimated using the same WARMF output applied to a multiple regression model.

Water Year	April	May	**Apr-May**	June	July	August	September	October	**Jun-Oct**
1999	28%	31%	**29%**	41%	50%	55%	65%	60%	**53%**
2000	22%	33%	**23%**	45%	52%	63%	60%	64%	**55%**
2001	20%	19%	**20%**	46%	56%	60%	67%	55%	**55%**
2002	19%	20%	**19%**	54%	55%	52%	62%	69%	**57%**
2003	41%	42%	**42%**	55%	67%	75%	74%	78%	**69%**
2004	35%	18%	**22%**	39%	60%	62%	68%	66%	**56%**
2005	12%	28%	**16%**	42%	49%	60%	67%		

~~*Table P4.*~~ *Monthly total phosphorus loads estimated by applying the percentage TP reductions in the table above from the WARMF full protection simulation to the multiple regression model output for the mouth of Hangman Creek from 1998 to 2005* ~~*in Table P3*~~*. Phosphorus loads are in units of pounds per day (lbs/day). The Spokane River Dissolved Oxygen TMDL monthly load allocations for Hangman Creek are shown for comparison Ecology (2007). Values bolded meet the Ecology 2007 load allocations.*

Year	*April*	*May*	*June*	*July*	*August*	*September*	*October*	*April - May*	*June – October*
1998	-	-	-	-	-	-	***1.5***	**-**	**-**
1999	*99*	***32***	*11*	*5.0*	*3.0*	*1.9*	*2.6*	*65*	*4.5*
2000	*284*	*55*	*20*	*5.7*	*1.8*	*2.0*	***2.0***	*169*	*5.5*
2001	*78*	*58*	***4.5***	***1.8***	***0.6***	***0.2***	***0.7***	*68*	***1.4***
2002	*210*	***34***	***6.6***	***1.9***	***1.0***	***0.8***	***0.8***	*120*	***2.1***
2003	***54***	***22***	***3.6***	***0.6***	***0.2***	***0.4***	***0.4***	***37***	***0.8***
2004	***20***	*137*	*13*	***2.1***	***0.6***	***0.6***	***1.0***	*78*	***2.8***
2005	*63*	*83*	***7.6***	***1.9***	***0.2***	***0.1***	**-**	*79*	**-**
Load Allocation	*60.6*	*40.6*	*8.3*	*3.8*	*1.3*	*1.0*	*2.1*	*50.6*	*3.3*

Of particular interest with these estimates are the results for 2001, the Spokane River TMDL critical condition, and the low-flow years of 2003 and 2005. Under ~~best potential~~full protection conditions, April and May TP loads in 2001 would have been reduced by 20%. The model estimates suggest the loading ~~capacity~~ in 2001 was higher than the recommended April-May seasonal allocation of 50.6 lbs/day. The loading capacity for the June through October season has an estimated 55% TP reduction over current conditions and appears to comply with the recommended load allocation of 3.3 lbs/day.

Table P7. A summary of current total phosphorus (TP) loads, and recommended load and waste load allocations (WLA) for sub-watersheds and point sources in Hangman Creek. Analyses are based on long-term daily average loads over a period of seven water years with a variety of flow regimes.

Hangman Creek Sub-watershed or Point Source	*Current Load lbs TP/day (kg TP/day)*	*WLA or Load Allocation lbs TP/day (kg TP/day)*	*Target Reduction (%)*
Hangman Creek at State Line	*22 (10)*	*16 (7.3)**	*26%*
Tensed WWTP	*2.7 (1.2)*	*0.04 (0.02)*+*	*98%*
Hangman Creek from Tekoa to Bradshaw Road & Little Hangman	*47 (21)*	*36 (16)*	*23%*
Little Hangman at State Line	*15 (6.8)*	*13 (6.1)**	*10%*
Tekoa WWTP	*5.7 (2.6)*	*0.11 (0.05)+*	*98%*
Hangman Creek from Bradshaw to Duncan Road and Gage	*61 (28)*	*47 (21)*	*23%*
Fairfield WWTP	*1.7 (0.76)*	*0.03 (0.01)+*	*98%*
Spangle	*0.32 (0.15)*	*0.004 (0.002)+*	*98%*
Rock Creek at Mouth	*15 (6.8)*	*13 (5.9)*	*14%*
Rockford WWTP	*0.98 (0.44)*	*0.02 (0.009)+*	*98%*
Freeman School District WWTP	*0.002 (0.001)*	*0.002 (0.001)*	*-*
Rock Creek at State Line	*12 (5.6)*	*11 (5.0)**	*10%*
Marshall Creek at the Mouth	*5.7 (2.6)*	*5.7 (2.6)*	*1%*
Cheney WWTP	*0.004 (0.002)*	*0.004 (0.002)*	*-*
Spokane(City & County) stormwater	*0.28 (0.13)*	*0.28 (0.13)*	*-*
Hangman Creek at Mouth	*101 (46)*	*78 (36)*	*20%*
City of Spokane, County, and WA Dept. of Transportation stormwater	*3.2 (1.5)*	*3.2 (1.4)*	*-*

** Allocations and WLA for areas outside of the State of Washington jurisdiction are shown for demonstration purposes.*

+ Estimate based on total phosphorus effluent concentration of 0.05 mg/L (50 µg/L).